OFFICE OF THE CHIEF TECHNOLOGIST

TechPort

TECHNOLOGY FACT SHEET

General Information

Title of Technology Development: Acoustic Emission Health Monitoring of Fill Purge COPV's Used in Aerospace and Automotive Applications and Designed for Long Cycle Life

Responsible NASA Mission Directorate or Office: Center Independent Research & Development

NASA Lead Center or Facility: White Sands Test Facility

NASA Supporting Centers and Facilities: No data provided

NASA Program: Center Innovation Fund: JSC CIF (also includes JSC IRAD)

NASA Project: 12137

NASA Program Executive: John Falker

NASA Program Manager: Ronald Clayton

NASA Project Manager: Jess Waller

Principal Investigator: Jess Waller

States with Work: NM

Contractors Performing Work: Jacobs, GeoControl Systems, Inc.

Sources of Funding

NASA Mission Directorates or Offices Providing Funding/Resources: Center Independent Research & Development, Center Innovation Fund

NASA Centers and Facilities Providing Funding/Resources: Johnson Space Center, White Sands Test Facility

Other U.S. Government Agencies Providing Funding/Resources: No data provided

U.S. External Partners Providing Funding, Academia or Commercial: No data provided

International Partners Providing Funding/Resources: No data provided

Technology Project's Mappings

Primary Space Technology Roadmap - Technology Area: TA 4: Robotics, TeleRobotics & Autonomous Systems – Detailed Primary Space Technology Roadmap - Technology Area: TA 4.5: Autonomy

Secondary Space Technology Roadmap - Technology Area: TA 12: Materials, Structures, Mechanical Systems & Manufacturing

Additional Space Technology Roadmap - Technology Area: No data provided

Project Details

Project Start Date: Jan-01-2013	**Project End Date:** Apr-01-2013
Project Start TRL: 3	**Project End TRL:** 3

Brief Description (abstract) of Technology Project: Abstract Problem Description: Cumulative composite damage in composite pressure vessels (CPVs) currently is not monitored on-orbit. Consequently, hazards due to catastrophic burst before leak (BBL) or compromised CPV reliability cannot be ascertained or mitigated, posing a risk to crew and mission assurance. The energy associated with CPV rupture can be significant, especially with high pressure gases are under containment, and the energy releases can be severe enough to cause injury, death, loss of assets or mission. Dual-Use Rationale: CPVs similar to those used by NASA on ISS, for example, are finding increasing use in automotive and transportation industry applications. These CPVs generally have a nonload sharing liner and are repeatedly filled over their service lifetime, typically with hydrogen or compressed natural gas (CNG). The same structural health monitoring equipment and software developed by NASA WSTF for evaluating, in real-time, the health of NASA CPVs on ISS will be used to evaluate the health of automotive CPVs, the only differences being the type and design of the CPV, and the in-service lifetime pressure histories. HSF Need(s)/Performance Characteristic(s) Supported: 1) Enable on-board vehicle systems management for mission critical functions at destinations with > 3 second time delay 2) Enable autonomous nominal operations and FDIR for crewed and un-crewed systems 3) Reduce on-board crew time to sustain and manage vehicle by factor of 2x at destinations with > 6 second time delay (see Crew Autonomy sheet) 4) Reduce earth-based mission ops “back room engineering” requirements for distant mission support delay (see Mission Autonomy sheet)>

Technical Performance Measures:

Measure	Unit	Quantity

Description of Capability This Technology Provides: CPVs similar to those used by NASA on ISS, for example, are finding increasing use in automotive and transportation industry applications. These CPVs generally have a nonload sharing liner and are repeatedly filled over their service lifetime, typically with hydrogen or compressed natural gas (CNG). The same structural health monitoring equipment and software developed by NASA WSTF for evaluating, in real-time, the health of NASA CPVs on ISS will be used to evaluate the health of automotive CPVs, the only differences being the types of CPV (test article) being evaluated, and the in-service lifetime pressure histories.

Anticipated Benefit to NASA for Funded Missions: CPVs similar to those used by NASA on ISS, for example, are finding increasing use in automotive and transportation industry applications. These CPVs generally have a nonload sharing liner and are repeatedly filled over their service lifetime, typically with hydrogen or compressed natural gas (CNG). The same structural health monitoring equipment and software developed by NASA WSTF for evaluating, in real-time, the health of NASA CPVs on ISS will be used to evaluate the health of automotive CPVs, the only differences being the types of CPV (test article) being evaluated, and the in-service lifetime pressure histories.

Anticipated Benefit to NASA for Unfunded/Planned Missions: No data provided

Anticipated Benefit to Commercial Space Industry or Other Government Agencies: CPVs similar to those used by NASA on ISS, for example, are finding increasing use in automotive and transportation industry applications. These CPVs generally have a nonload sharing liner and are repeatedly filled over their service lifetime, typically with hydrogen or compressed natural gas (CNG). The same structural health monitoring equipment and software developed by NASA WSTF for evaluating, in real-time, the health of NASA CPVs on ISS will be used to evaluate the health of automotive CPVs, the only differences being the types of CPV (test article) being evaluated, and the in-service lifetime pressure histories.

Detailed Description of Technology Project

No data provided